

REMARKS

In the patent application, claims 3-17, 20-23, 25 and 27-30 are pending. In the office action, all pending claims are rejected. Applicant has amended claims 4, 21, 22, 28 and 29 and added new claim 31.

Claims 4 and 21 have been amended so that M is a positive integer equal to or greater than 1. The support can be found in the original claim 2.

Claims 4 and 21 have also been amended to change the expression “absolute values of differences between corresponding individual coefficients in each of said rectangular blocks of coefficients and said at least one reference block of coefficients” to “absolute values of differences between individual coefficients in each of said rectangular blocks of coefficients and corresponding individual coefficients in said at least one reference block of coefficients”

Claims 21 and 22 have been amended to change the term “encoder” to “apparatus”.

Claims 28 and 29 have been amended to change the claim dependency.

New claim 31 is dependent from claim 6 and includes the limitation that the weighting factor is determined at least partially based on residual energy of a previous video frame when M is greater than 1. The support can be found in claim 7 and p.8, line 13-17 of the specification.

No new matter has been introduced.

At section 4 of the office action, claims 3-7, 9-17, 20-23, 25 and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Koto et al.* (U.S. Patent Application Publication No. 2003/0215014 A1, hereafter referred to as *Koto*), in view of *Kato et al.* (U.S. Patent No. 6,151,360, hereafter referred to as *Kato*). The Examiner cites *Kato* for disclosing using the sum of absolute values of inter-picture residues in picture analysis.

It is respectfully submitted that independent claim 4 has the following limitations:

1) selecting M reference frames for a given original video frame from a video sequence having a plurality of video frames, each frame containing a plurality of coefficients, wherein M is a positive integer equal to or greater than 1;

- 2) partitioning said original video frame into rectangular blocks of coefficients; and
  - from each of the M reference frames:
  - 3) forming at least one reference block of coefficients from an offset of the rectangular blocks; and
  - 4) obtaining a block difference at least partially from a summation of absolute values of differences between corresponding individual coefficients in each of said rectangular blocks of coefficients and said at least one reference block of coefficients; and
  - 5) optimizing the offset at least partially based on the block difference.

In the claimed invention, the block difference is obtained at least partially from a summation of absolute values of the differences between **individual** coefficients in each block and the **corresponding individual** coefficients in a reference block.

According to *Koto*, the predictive reference block is generated by computing a linear sum of the reference blocks using weighting factors (paragraph [0012]). As shown in Figure 1, the reference blocks are summed by a predictive macroblock generator 119 by an adder to form a predictive macroblock (132, for example) before the predictive macroblock is subtracted from the input video signal 100 by the subtractor 110 in order to obtain the prediction error signal 101. Thus, according to *Koto*, the reference blocks are used to form a weighted predictive block. The weighted predictive block is then used to compare with the current block for obtaining a block difference. The encoder as disclosed in Figures 1, 2, 3, 8 and 9 only has a plurality of summing devices to form the weighted predictive block. Such an encoder cannot be used to obtain the block difference at least partially from a summation of the **absolute** values of the differences between individual coefficients in each block and corresponding individual coefficients in a reference block.

The Examiner admits that *Koto* fails to disclose obtaining the block difference at least partially from a summation of the absolute values of the differences between corresponding individual coefficients in each block, but points to *Kato* for disclosing a method for encoding a video signal using statistical information, wherein the sum of absolute values of inter-picture residuals is among the different sorts of information on picture characteristics used in the picture analysis (column 16, lines 20-34).

It is respectfully submitted that *Kato* discloses a picture encoding apparatus (Figures 3 and 13) wherein a picture analysis circuit 60 is used to find the information derived from the statistical properties of the input video signals or the information on picture characteristics.

In one embodiment, the mean value M of motion vector, the mean value L and the variance V of the luminance signal Y of input pictures as found by the picture analysis circuit 60 and a mean value R of the amount of the motion vectors are used by the bit rate calculating circuit 32 to determine the code amount b allocated to each macroblock (Figure 3, col.5, lines 49-59; col.6, lines 14-27; step ST2 of Figure 4). From the allocated code amount b, the quantization circuit 46 of the second encoding circuit 40 quantizes the coefficient data in order to generate quantize data (col.6, lines 27-31; step ST3 of Figure 4).

In another embodiment, a sum E is also used to determine the code amount b1 per unit time, additional to L, V, R and M by the bit rate calculating circuit 32 (step ST32 of Figure 14; col.17, lines 1-8). The sum E is used by the bit rate calculating circuit 32 to estimate an amount  $y'i$  of generated codes in a macro-block (col.17, lines 23-340; Equation 18). The sum E is referred to as F which is the output from inter-frame information analysis circuit 62 (Figure 13). In this embodiment, the picture analysis circuit 60 is used to find, addition to L, V, R and M, the sum E which is the sum of absolute values of the inter-picture prediction residual of the amount of motion vector calculated very pre-set time interval (col.16, lines 8-67). The code amount b1, as determined in step ST32 by the picture analysis circuit 60, is then used by the encoding circuit 40 to quantize coefficient data in order to generate quantized data (col.17, lines 9-13; step ST33 of Figure 14).

As shown in Equation 12, *Kato* discloses that E is the sum of absolute difference between  $Y_i$  and  $R_i$ . According to *Kato*, the sum E of absolute values of differences of luminance signals  $R_i$  of a macro-block referred to by the motion vector (col.16, lines 25-28). In the preceding paragraph (col. 16, lines 8-24), R is defined as the average value of the chroma signal  $C_r$ , calculated every preset time interval. R is also defined as a mean value of the amount of the motion vectors (col.5, lines 49-59).  $R_i$  is also defined as the mean value of the chroma signal  $C_r$  of the  $i$ 'th macro block (col.8, lines 7-9).

In Equation 13, E is the sum of absolute difference between  $Y_i$  and  $Y_{av}$  (not  $A_{av}$ , which is not defined everywhere), where  $Y_{av}$  is an average value of the luminance signal

$Y_i$  in the macroblock (col.16, lines 53-64). The quantity  $Y_i$  is defined as the amount of generated codes, presumably for the  $i$ 'th macroblock (col.8, lines 37-39).

The conflicting definitions for  $R$  and  $R_i$ , render the disclosure in *Kato* un-enabling. It is difficult to know what exactly Equation 12 means.

With all of the conflicting definitions of  $R$  and  $R_i$ , the sum  $E$  is either calculated from 1) the absolute difference between the luminance signal and its average (Equation 13), or 2) the absolute difference between the mean value of chroma signal and the luminance signal, or 3) the absolute difference between the luminance signal and the mean value of motion vector (Equation 12). Alternatively,  $E$  is calculated from the estimate value  $Y_i$  of the macroblock based amount of generated codes. Even with these possible interpretations of Equations 12 and 13,  $E$  is not the sum of the absolute differences between individual coefficients in a rectangular block and the corresponding individual coefficient in a reference block. Furthermore, *Kato* only uses the sum  $E$  by the bit rate calculating circuit 32 to determine bit rate, or the code amount per unit time.

In sum, *Kato* does not disclose or suggest that the block difference is obtained at least partially from a summation of absolute values of differences between individual coefficients in each of said rectangular blocks of coefficients and corresponding individual coefficients in said at least one reference block of coefficients, so that the block difference is used to optimize the offset.

For the above reasons, *Koto*, in view of *Kato*, fails to render claim 4 obvious.

Independent claim 21 also has the limitation of obtaining a block difference at least partially from a summation of absolute values of differences between individual coefficients in each of said rectangular blocks of coefficients and corresponding individual coefficients said at least one reference block of coefficients. As with the reasons regarding claim 4 above, *Koto*, in view of *Kato*, fails to render claim 21 obvious.

As for claims 3, 5-7, 9-17, 20, 22, 23, 25 and 27-31, they are dependent from claims 4 and 21 and recite features not recited in claims 4 and 21. For reasons regarding claims 4 and 21 above, claims 3, 5-7, 9-17, 20, 22, 23, 25 and 27-31 are also distinguishable over the cited *Koto* and *Kato* references.

At section 6, claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Koto*, in view of *Kato*, and further in view of *Wu et al.* (U.S. Patent No. 6,700,933, hereafter referred to as *Wu*). The Examiner cites *Wu* for disclosing that each of the M video frames selected as the M reference frames is computed by decoding the same frame of original video at a variety of quality settings.

Claim 8 is dependent from claim 4. Thus, claim 8 is also distinguishable over the cited *Koto*, *Kato* and *Wu* references.

CONCLUSION

Claims 3-7, 9-17, 20-23, 25 and 27-31 are allowable. Early allowance of all pending claims is earnestly solicited.

Respectfully submitted,



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